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A NEW METHOD FOR THE DETERMINATION
 OF THE THICKNESS OF THE EARTH'S CRUST

Prof V. F. Bonchkovskiy

The thickness of the earth's crust is not identical in all regions. In Western Europe, for example, it is close to 30 kilometers, while in Middle Asia and Japan it is 40-50 kilometers. This data was obtained from instrumental records of near-by earthquakes. These records revealed, besides waves propagated in the crust along the shortest path, waves which reach the ultrabasalt layer and then return to the earth's surface. The waves created in powerful explosions also permit determination of the thickness of the earth's crust. Important results were obtained by the expedition of the Seismological Institute of the Academy of Sciences USSR from the powerful explosion in Korkino in Western Siberia. The thickness of the crust was found to be 37 kilometers, according to the recordings of nine specially equipped stations located 53 to 554 kilometers from the explosion point. Both methods (near-by earthquakes and powerful explosions) have defects, however; the first due to the positionally restricted character of earthquakes, or earthquake-free nature of some regions to be studied, and the second, to its expense.

Present-day seismic instruments such as electrodynamic seismographs of Academician B. B. Golitsyn and D. P. Kirnos, Scientific Collaborator, Geophysics Institute, Academy of Sciences USSR, are capable of recording very distant earthquakes. The use of seismographs of distant earthquakes to solve the problem of the thickness of the earth's crust would be of great importance for science. A. A. Treskov, chief, "Irkutsk" Seismic Station, and Scientific Collaborator, Geophysics Institute, Academy of Sciences USSR, worked on this problem in 1947 and 1948. Waves reflected by the earth's surface, as well as waves propagated directly from the earthquake's centrum, were registered on the seismographs of distant earthquakes. Along with the latter, Treskov also discovered waves reflected from the bottom of the crust, and since the distance traveled was comparatively short, they were registered before the waves reflected

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from the earth's surface. The time interval between entry of waves reflected from the earth's surface and from the bottom of the crust depends upon the thickness of the crust in the region of reflection and increases with this thickness, making it possible to determine this quantity.

The worth of the new method lies in the fact that the thickness of the crust in the most diverse regions can be found from observations at any station. Thus, from seismograms in Sverdlovsk, the thickness of the crust in Italy and in equatorial Africa can be determined; from observations in Irkutsk, the thickness in Japan and the Bardo Sea; from Pulkovo recordings, the thickness in Central and Middle Asia; from Moscow, the thickness in the Okhotsk Sea, etc.

The study of deep earthquakes has already widely extended investigations of this type, although in this case the thickness of the crust is established only for regions close to seismic centra. Thickness determinations from seismograms of normal earthquakes are more promising in this respect, since the position of the point of reflection (in the region whose thickness is to be determined) depends essentially upon the geographical position of the seismic station and observations of the same earthquake at remote stations permit thickness determinations in completely different regions.

The establishment of a more or less complete picture of the relief of the crust's bottom is very important for both geophysics (the problem of isostatic equilibrium) and geology. It is hoped that the new method for the determination of the crust's thickness from observations of remote earthquakes will permit a solution of this interesting problem.

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